IS POLLUTION THE PRICE OF PROGRESS?

By

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SUMMARY:

The aims of policies (a) to reduce air pollution and (b) to increase the economic development of a country are liable to clash. The nature of the clash is discussed and guide lines are given for minimising the degree of clash.

OPSOMMING:

Beleidsdoelwitte om (a) lugbesoedeling te verminder en (b) die ekonomiese ontwikkeling van 'n land te verhoog is onderhewig aan botsing. Die aard van die botsing word bespreek en riglyne vir die verkleining van die graad van botsing.

You have been requested to write on the relationship between the economic development of a country and the problem of air pollution that it may be experiencing because of this economic growth.

First of all, it is necessary to establish, is air pollution a problem or likely to become a problem in the future.

To quote in this regard from "The Global 2000 Report to the President" prepared by the Council on Environmental Quality of the U.S.A.

"Under the present policies and practises industrial growth during the next 20 years is likely to worsen air quality, particularly in the lesser developed countries."

Even now observations in these countries indicate that levels of sulphur dioxide, particulates, nitrogen dioxide and carbon monoxide are far above the levels considered safe by the World Health Organisation.

Regarding industrialised countries, despite recent progress in reducing various types of air pollution, air quality is likely to worsen as increased amounts of fossil fuels, especially coal, are burned. Emissions of sulphur and nitrogen oxides are particularly troublesome because they combine with water vapour in the atmosphere to form acid rain and other acid deposition.

Another environmental problem related to the combustion of fossil fuels is the increase in the levels of carbon dioxide.

Levels have increased from 290 parts per million at the time of the industrial revolution to 350 parts per million by 1980 and the CO2 levels in the atmosphere are likely to exceed 400 parts per million by the year 2000.

The resulting warming effect on the atmosphere is expected to alter precipitation patterns and have a considerable effect on the worlds agriculture. Just what the effect will be is not clear. Some authorities claim that an increase of CO2 levels to 2–3 times the present value will result in considerable increases in crop yields and will go far to solve the food problem.

On the other hand concern is expressed that the warming of the atmosphere will cause melting of the polar ice caps and by the middle of the next century will force abandonment of many coastal cities.

During a visit to the United States during March this year we had in-depth discussions with members of the Biomedical and Environmental Division of the Brookhaven National Laboratories on Long Island where a great deal of work in this connection has been carried out.

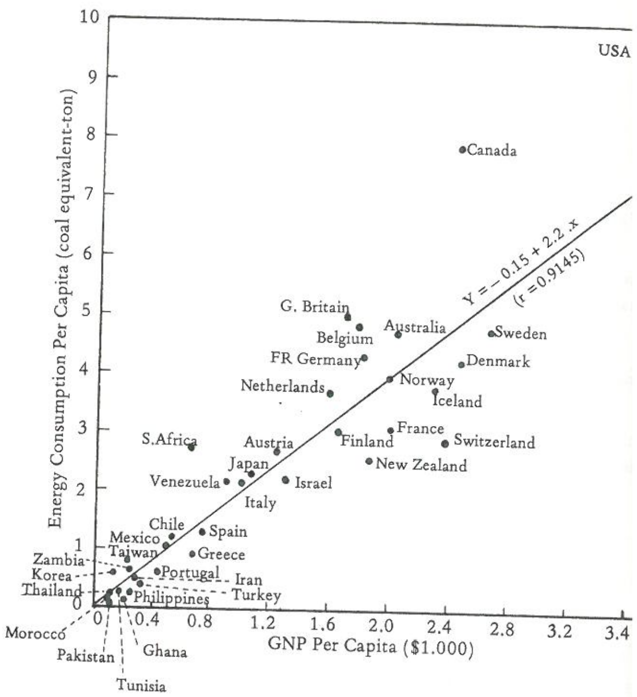
To quote from these discussions a connection has been found between pollution and respiratory diseases, chronic heart disease and the like and an attempt has been made to estimate mortality rates related to pollution levels but this is difficult as the health of the population is affected by several interacting forces. Most control authorities adopt the view that, since it is not clear at what level of air-pollution damage to health will occur, it is prudent to maintain, if possible, existing air qualities.

The production of pollution is an unavoidable consequence of the generation and use of energy which in turn is coupled to the Gross National Product (G.N.P.) per capita generally in accordance with the graph. (Fig. 1)

The relationship is generally linear with a scattering of points due to difference in climate and local fuel prices and emphasis on heavy industry. It indicates however that as the G.N.P. per capita in a country increases so will the energy consumption per capita. So also will pollution production increase.

The production of atmospheric pollutants is further dependent upn the energy source, i.e. fossil fuel or hydro. At present 97% of the worlds industrial energy production comes from fossil fuel.

Countries with the greatest population growth coupled with the greatest increase in per capacita G.N.P. should therefore adopt the most stringent pollution control methods. Unfortunately most countries in this category put progress before pollution abatement programmes.

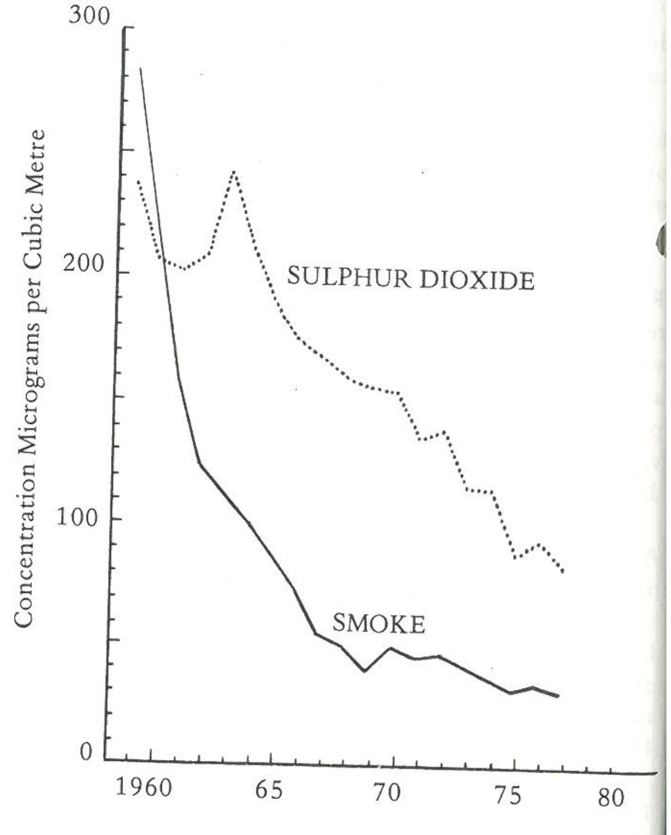


I recently attended a symposium at Aberdeen University where a number of representatives of third world countries were present. These people complained bitterly that the industrialised world was solving its air pollution problems by dumping heavy polluting industries on their doorstep which would not be permitted at home without expensive pollution control measures.

While the production of pollution to a large extent is energy related, the degree that pollution is controlled is based more on public awareness, leading to political pressure being put on legislators, than on any economic or technological factor.

The processes involved in air pollution and its control are complex, poorly understood, inherently variable and there is no prospect that air pollution or costly control measures will ever go away. We must therefore learn how to deal with them.

It is also obvious that when considering the diversified nature of atmospheric contaminants and the complicated way in which these pollutants react with each other, successful and economic control measures cannot be instituted without a comprehensive knowledge of the amounts of particular pollutants emitted from a new source as well as those already existing in the environment. This requires research but unfortunately the need for this does not always receive the attention or the funding it deserves.



At this stage it will be as well to examine how other countries have managed this problem.

That certain countries are succeeding are shown by the graph. (Fig. 2)

This depicts the decrease in pollutants in the United Kingdom during the period 1969 – 1979.

The very high concentrations of smoke and sulphur-dioxide that used to occur during temperature inversions have virtually disappeared and there is no longer any evidence of the sudden increase in mortality and morbidity that used to be associated with them.

In the U.K. the responsibility for clean air rests primarily with local authorities and in addition industrial premises that give rise to offensive emissions are subject to the control of the "Alkali and Clean Air Inspectorate".

The control philosophy in the United Kingdom is similar to that in South Africa and is based on the "best practicable means" coupled with a "tall stack policy".

It has been claimed however that this policy may be reducing the problem in the U.K. but is turning this country into an exporter of pollution via long range atmospheric transportation. (Norway and Sweden).

In the United States of America the "tall stack policy", as a means of controlling S02 pollutant, has been declared invalid by the Supreme Court and flue gas desulphurisation is insisted upon.

In addition the U.S.A. requires that "the best demonstrated technological system" of continuous emission reduction must be used. This is described as the system that has been "adequately demonstrated, taking cost and other factors such as energy, into account". This is a more stringent definition than that applied to "best practical means".

In addition very stringent controls are placed on emissions by the Environmental Protection Agency these controls being enforced by the Courts of Law.

In the case of particulate matter emitted, two standards are set. Stack opacity may not exceed 20% as measured by an opacity meter calibrated and sealed by the E.P.A. The second requirement is that the mass of particulate matter emitted may not exceed 0,03 lbs per million BThU of heat input. Standards are also set for sulphur-dioxide and oxides of nitrogen, all of which are related to heat consumption. It is of interest to note that each public utility installation in the U.S.A. has a resident "Environmental Officer". Should any of the emission standards be exceeded for any reason then he is obliged to advise the E.P.A. accordingly, even if it results in load reduction or shutting down of the installation. The E.P.A. guidelines are worth repeating:-

(a) Standards set must not give a competitive advantage to one State over another in attracting industry.

(b) The standards for pollutants must maximise the potential for long-term economic growth by reducing emissions as much as is practicable.

(c) The standards must to this extent, force the installation to adopt all the control technology that will ever be necessary on new plants at the time of construction when it is cheaper to install it thereby minimising the need for expensive retrofit in the future when air quality standards begin to set limits to growth.

(d) The standards must to a practical extent force new installations to burn high sulphur fuel thus freeing low sulphur fuel for use in existing installations where it is harder to control emissions without uneconomic retrofit and where low sulphur fuel is needed to comply with emission standards.

(e) Standards must be so strict so as to force the development of new technology.

Perhaps the country with the most complicated pollution control measures is West Germany. Here again the requirements are to install equipment according to the "latest state of the technology".

The regulations here cover not only stack emissions but "immissions" which are ground level concentrations. Standards are set for both of these aspects.

In addition not only is the mass of stack emissions controlled but stack heights are determined for each pollutant separately where an installation emits a number of pollutants. Calculations are carried out to determine the stack height to reduce the "immission" of each pollutant to the set standard. The greatest stack height is then adopted for the installation.

In order to set up standards for emissions a monitoring grid is set up at least one year before the commissioning date of the installation whereby the existing level of a range of ground level concentration "immissions" is measured. These results are used to determine what additional amounts of any particular pollutant may be permitted from the new installation and this information is fed back into the design of the pollution control equipment and the stack height.

South Africa is therefore by no means unique in experiencing a pollution problem resulting from an industrialised society but South Africa certainly has a number of unique problems of its own to deal with.

(a) First of all we have a high rate of growth requiring a doubling of energy production within the next ten years.

(b) Situated as we are in the sub-tropics meteorological conditions exist which are very unfavourable to the dispersion of pollutants. It is notable that most industrialised countries are well north of the sub-tropics and do not experience similar conditions.

For instance the average SO2 concentration per sq km in the Transvaal Highveld is higher than 70% of that in the industrialised area of the RUHR in Germany although the generation per unit area on the Highveld is far lower than in the RUHR. The difference is to be found in the dispersion characteristics of the atmosphere.

(c) South Africa is unique in that 85% of its energy requirements are met from solid fuels against 60% for the United Kingdom and 25% from the United States of America.

(d) Finally South Africa has an intense problem resulting from low level pollution sources which become trapped under a low lying inversion layer and which emanate from coal burning domestic stoves utilised by the lower income and less sophisticated section of our society. This problem has been the cause of much discussion and research by the National Air Pollution Advisory Council and is not an easy one to solve.

As most industrialised countries have already passed through the "high rate of growth" stage, it will be as well to see what we can learn from them regarding pollution control.

First there is no instant solution to the problem of air pollution. Second while health problems to the population have been indicated, it is by no means clear just what level of which pollutant causes the problem. Third, the solution adopted for one country must not be blindly followed in another, each country must solve its problem in the way best suited to its local conditions.

Perhaps the clearest message of all comes from the guidelines of the Environmental Protection Agency of America and one of these can well prove to be an important message to Industrialists.

"Standards must force the installation to adopt all the control technology that will ever be necessary on new plants at the time of construction when it is cheaper to install it thereby minimising the need for expensive retrofit in the future when air quality standards begin to set limits to growth".

The message here is don't install the minimum control equipment that you can get away with at the time. Pollution control equipment has a nasty habit of deteriorating with time and as pollution control measures tighten up with further deterioration of air quality the Industrialist will sooner or later be forced to install an expensive retrofit, which may in fact force him out of business. This became evident during a recent tour of the United States of America where the power utility companies were forced to do just that on existing plants. Some of the resulting retrofit installations seen were both enormously expensive and technically horrifying. This problem of retrofitting higher efficiency emission control equipment is now being felt to an increasing degree in South Africa.

The E.P.A. guidelines also contain a message for our own Control Authorities.

1. The pollution control requirements should be strict enough to enforce the development and use of new technology but not so strict as to cause undue economic hardship.

2. All new sources within a defined category must be subjected to the same rules reducing the need for case by case negotiation and to eliminate the possible accusation that one installation has had favou treatment.

3. Each source should be free to find its own best s tion involving a combination of clean fuels, con devices, careful operation and so on and a spec technology should not be forced upon them.

4. There must be a continuing high level of basic search in order to provide the vital data on whicl set standards of emission and control.

It has been claimed that the E.P.A. regulations are too str To quote from the article "The environmental Protect Agency Against the People", "the predicament in Amer relates to one single regulation of the E.P.A. namely the strictions that the Agency placed on sulphur dioxide en sions from electric power plants. The evidence shows t such a regulation does no good at all and has cost the ho owner and apartment dweller well over 60 billion doll in inflated residential electricity prices in only ten years it has inflated the price of all other commodities by anotl 240 billion dollars in the same period ... it has caused c country to rely more heavily on imported oils, etc. In fa during a depressed period in the U.S.A. when unemplo ment was high cars were seen riding around with bump stickers "If you are hungry eat en Environmentalist".

Experiments carried out by the Central Electricity Ger rating Board indicate that limited amounts of SO2 may ev be beneficial to plant life. Natural soils contain up to 0, of sulphur. If the supply is too low sulphur may have to added in the form of fertilisers to obtain good agricultur yields and from this point of view some additional sulph from the atmosphere is beneficial. A single dressing ammonium sulphate fertiliser is equivalent to 16 grams sulphur-dioxide per square meter – well in excess of an deposition from air pollution.

This contains a message to our Legislators. Treat the pro blem of air pollution as well as all environmental problem very seriously and take timeous action to conserve environ mental quality. Do not wait until matters deteriorate to suc a point that political pressures force you to act. At the sam time however do not overreact.

In countries where this has happened the legislature ha overreacted imposing laws which create an "overkill" situa tion which restrict economic growth and which are intensel inflationary and not in the overall interests of the country The environmental goals and objectives must be clearly de fined and an overall plan must satisfy the technical, econo mical and political constraints. When considering air pollu tion however, remember that the atmosphere is like a batl tub. Turn the taps on if you want to but make sure that you do not turn them on so hard that the plug hole is not large enough to drain the water away. If you do eventually the bath tub will overflow and cleaning up the resulting mess can be very costly if it can indeed be done at all. The price you may then have to pay for pollution may well be your own life. The answer to the question, how big is the plug hole, is the difficult one to answer and here again I make a plea for, not only research but co-ordinated research. At the moment not only is insufficient research carried out but information resulting from unco-ordinated research is often not made available to those who need it most – those responsible for setting and administering our air pollution standards.

REFERENCES

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The Environmental Protection Agency against the People
A.J. O'Neal Jr.

SYMPOSIUM ON RESEARCH ON ATMOSPHERIC SCIENCES IN SOUTH AFRICA

This three-day symposium covering all aspects of weather, climate and Atmospheric Research in South Africa is being organised by the Atmospheric Sciences Division of the National Physical Research Laboratory, CSIR in collaboration with the Soil and Irrigation Research Institute and the Weather Bureau.

Atmospheric sciences span a wide range of disciplines – meteorology, mathematics, physics, chemistry, paleoclimatology and others. Results of research are presented to various specialist societies but there is at present no common forum to encourage interdisciplinary exchanges. The planned symposium will attempt to rectify this.

Another objective of the symposium will be to discuss the formation of an association of atmospheric scientists.

Indications of topics to be included are:

(a) *Weather and Climate*

All branches of meteorology and climatology, weather modification, thunderstorms, atmospheric electricity, solar/terrestrial effects on weather and climate.

(b) *Atmospheric interactive impacts*

Climatic change, atmospheric chemistry, air pollution.

The venue is the CSIR Conference centre, Scientia, Pretoria and the date from 18 to 20 October 1983.

Further information is available from the Symposium Secretariat S.331, CSIR. P.O. Box 395, Pretoria, 0001.

NATIONAL ASSOCIATION FOR CLEAN AIR NEWS

The Thirteenth Annual General Meeting of the Association was held on 25 November 1982 in the 450 Auditorium Conference Centre, CSIR, Pretoria.

The meeting which was held under the Chairmanship of the President, Dr G.P.N. Venter was attended by 46 members or representatives of members.

When presenting the President's Annual Report, he referred to the appointment of Dr J.W.L. de Villiers, President of NUCOR as the Honorary President of the Association.

After the formal proceedings of the meeting had been concluded, Dr G.P.N. Venter inducted Dr J.K. Basson into the President's chair for the period 1982–1984.

After thanking the Members for the honour conferred on him, Dr Basson announced the membership of the Council for 1982–1983 as follows:-

Dr J.K. Basson		President
Mr D.B. Gaynor		Vice President
Dr G.P.N. Venter		Immediate Past President
Dr N. Boegman		Mr R.C.S. Meyer
Mr C.J. Els		Mr C.J. Sharland
Dr R.S.J. du Toit		The Branch Chairmen
Mr G. Harrison	Mr J.L. Easterbrook	Director